Trends in Undergraduate Research (2023) 6(1): c7-15
https://doi.org/10.33736/tur.2810.2023

Implementation of Web-based E-learning System in Automobile Industry

NURUL AMIRAH MOHD NADZRI[1,2], & LING YEONG TYNG*[2]

[1]Department of Network Computing; [2]Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak, Malaysia
*Corresponding authors: ytling@unimas.my

ABSTRACT

Training is one of the most important human resource development activities in growing industries, especially the manufacturing industry. Preparing learning materials and tracking trainees' performance during a training session are the challenges faced by a local automobile manufacturing company. This project aims to develop a web-based E-learning management system for training purposes at a local automobile company. This online system will complement the traditional method for trainers in preparing learning materials and tracking trainees' performance. In addition, this system supports in-class activities for trainees to learn and understand, explore, and exchange ideas outside the classroom, while trainers can manage and upload course materials. In order to evaluate the user acceptance towards the system, several tests were conducted. It is envisaged that the proposed system will provide a more convenient way for a local automobile company to train their trainees.

Keywords: Education, E-learning, Training, Automobile

INTRODUCTION

Training is one of the most important human resource development activities in many industries, such as the automobile manufacturing industry. Training refers to a systematic setup where employees are instructed and taught matters of technical knowledge related to their jobs (Drawinbox, 2022). Different styles and methods of training are adopted for the skill and knowledge development of human resource. All these activities focus on the improvement of employee productivity through in-class learning.

E-learning, also known as online or electronic learning, refers to the acquisition of knowledge through the use of electronic technologies and media channels. It also encompasses interactive, network, or stand-alone computer education (Doug, 2020). E-learning can minimize educational costs and provide effective learning within an institution or organization (Nagra, 2020), and is aimed at replacing old-fashioned time, place, or content predetermined learning with a just-in-time, customized, and on-demand process of learning (Maurer, 2001). Thus, to keep up with the competitive environment, employers use E-learning methods to train their employees.

In this project, we engaged with a local automobile manufacturing company and proposed an E-learning training system.

A. Problem Statement

During a training session, a company may experience difficulty in conducting the session. For each recruitment, a new training schedule needs to be prepared. In the traditional approach, learning materials such as presentation slides and the hard copies of assessments are provided to the trainees. Trainers need to conduct assessments such as Pre-Test and Post-Test in a class and manually keep track of assessment performance. This is time consuming and error prone for the trainers.

Training equipment also needs to be setup during a training session. Trainees may need reference materials after being sent to the production line. Reference materials from the classroom such as printout notes would be a great help during the setup. As such, trainees rely on the printout notes since any digital devices are restricted in the production line.

B. Objectives

The main goal of this project is to develop an E-learning system for a local automobile company. To achieve this goal, the following objectives must be achieved:

1. To create an accessible system for trainers and trainees with a clear and concise navigation.
2. To construct trainer and trainee databases.
3. To implement a system that can evaluate student performance online.

C. Scope

The goal of this project is to transform the training activity from a conventional approach to an online one. This project is done for a specific developmental education department of a local automobile company. We designed and developed a web-based E-learning prototype system for the trainers, trainees and guests. The awareness, assessments and learning materials can be obtained not only during the training session but anytime through the systems.

By adopting the current technology, we designed an accessible system for trainers and trainees. This significantly improves the current traditional method at a local automobile company. Trainers of the company are able to enhance their teaching methods by uploading presentation slides, images and online assessments in the system. The trainees, on the other hand, are able to view their assessment data online. Any general user visiting the E-learning site for non-training purposes is considered as a guest. The features will act as an online platform to provide a more systematic learning approach to solve the issues mentioned in the problem statement.

LITERATURE REVIEW

There are several existing systems that have the similar features and specific functions which are related to the proposed system. The existing systems are UNIMAS (eLeap, 2019), GCube Learning (G-Cube, 2019), and Ardent Learning (Ardent, 2019). These systems are reviewed to identify the relevant feature components. Table 1 shows the comparison of the system features between the three existing systems and the proposed system.

Table 1. Comparison between the existing systems and the proposed system.

Evaluation Criteria	eLEAP UNIMAS	GCube Learning	Ardent Learning	**Proposed System**
Log in page	✓	NO	NO	✓
Registration page	NO	NO	NO	✓
Contact Form	✓	✓	✓	✓
Maps	NO	NO	NO	✓
FAQ	✓	NO	NO	✓
Course navigation	✓	✓	✓	✓
Online assessment	✓	NO	NO	✓
Review assessment grade	✓	NO	NO	✓
Update profile	✓	NO	NO	✓
View course images/video	✓	✓	✓	✓
Academic staff information	NO	NO	NO	✓

Most of the existing systems have features such as Contact Form, Course navigation, and View course images/video. Among these, UNIMAS eLEAP provides a Log in feature for the users to access to the system. However, it does not have a registration page. Meanwhile, both GCube Learning and Ardent learning have neither feature. UNIMAS eLEAP also has a FAQ or what is known as a forum page in the system which is used for interacting with the users, whereas the other systems have no FAQ page on their websites. Neither GCube Learning nor Ardent Learning have the Online assessment feature for the users, meanwhile UNIMAS eLEAP has the Online assessment and the learners are able to review their assessment grade. UNIMAS eLEAP also has the feature Update profile which the other two do not have.

Thus, for our project, we proposed a web-based learning system for a local automobile company with the following features: Login and Registration page for the users, Contact Form, FAQ and Academic staff information, Online assessment, Review assessment grade, Update profile, View course images/video, and

Academic staff information. We adopted most of the feature from UNIMAS eLEAP due to its wider coverage of system useability. To enhance the system and to adapt to the local needs of the automobile company, we also added the Academic staff information feature.

MATERIALS & METHODS

In order to develop a web-based e-learning system, we adopted the Agile model. It is a software development process framework that supports the iterative approach and process adaptability through the life cycle of a project (Tay, 2008). There are six phases in the Agile model, which are, requirements, design, development, testing, deployment and review. A summary of tasks for each phase in Agile model is shown in Table 2.

Table 2. Summary of tasks for each phase in the Agile model.

PHASE	TASKS
Requirement	1. distribute questionnaire to the targeted users which are the staff of the local automobile company 2. collect and analyze the feedbacks 3. identify hardware and software tools
Design	1. design the interactive web system, based on the requirement specification in the previous phase 2. define the overall system architecture with database
Development	1. implement and design of e-learning system is coded. 2. adopt HTML programming connected to MySQL database
Testing	1. design the test case based on the requirements 2. verify the interactive web system and check the logic errors
Deployment	1. recheck the codes 2. check the deployment issue based on the feedback.
Review	1. review the system by the users and the developer 2. assess which part of the objectives as per requirement have been achieved.

A. Requirements

In this section, the user, hardware, and software requirements are studied in order to complete this project. An online questionnaire has been distributed to multiple platforms in order to reach the targeted staff. Table 3 shows the questionnaire and user requirement results from 14 participants. The purpose of gathering questionnaire feedback is to analyze how much staff trainers know about E-learning, the teaching method conducted by trainer for the training sessions, and suggestion of implementing E-learning in an educational department of that company.

Table 3. Questionnaire and results of user requirements.

Questions	Results
1. do you know or are familiar with the term e-learning?	11 - yes
2. are you ready to move on to a new learning method which is e-learning?	14 - yes
3. do you agree to use E-learning to instill awareness and provide relevant information among all staff?	14 - yes
4. how frequently does a trainer have to conduct training session during a week?	11 - 1 to 3 times 3 - 4 to 6 times

5. do you face challenges during the preparation of materials for teaching and grading?	11 – yes
6. what kind of teaching method do you use for training sessions with the trainee?	9 - Powerpoint 5 - Visual manual courseware 8 - Post and Pre test 7 - Practical session
7. do you agree to make Pre and Post test assessment online?	11 - yes
8. rank how E-learning can help the trainers' training sessions.	1. Combine the Visual Machine courseware into e-learning 2. Do Pre and Post test assessment online 3. Increase the awareness and knowledge
9. Is E-learning important for the trainers in teaching and learning?	14 - yes

Hardware requirements: System Model: HP 14 Notebook PC, CPU: Intel® Core™ i3-4005U CPU @ 1.70GHz, RAM: 4.0 GB DDR3.

Software requirements: XAMPP, a cross-platform, Apache, MySQL, PHP and Perl to build WordPress site offline on a local web server.

B. Design

The design of the proposed project for the trainers of the local automobile company is presented in this section. We used Unified Modeling Language (UML) approach to modelling and documenting our software project. In order to structure the system requirement, a use case diagram, sequence diagram, and entity relationship diagram were drawn. Figure 1 shows the high level use case diagram for the proposed e-learning system. It shows the interaction between the trainer, trainee, and guest.

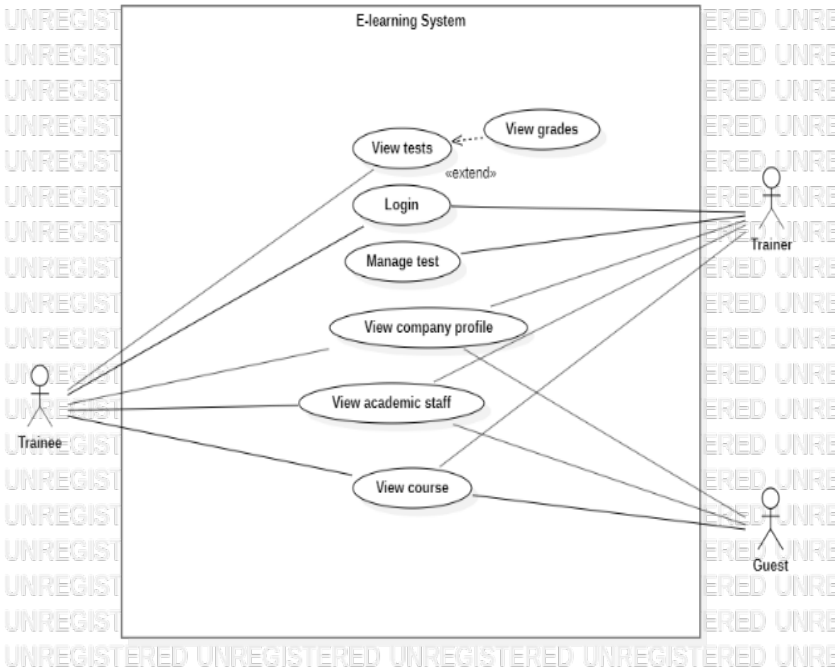

Figure 1. Use Case Diagram of the Proposed System.

Next, we used sequence diagram to capture the interaction between the users to exchange data or messages. Based on the use case, the collaboration among the uses are identified and visualized as shown in Figure 2.

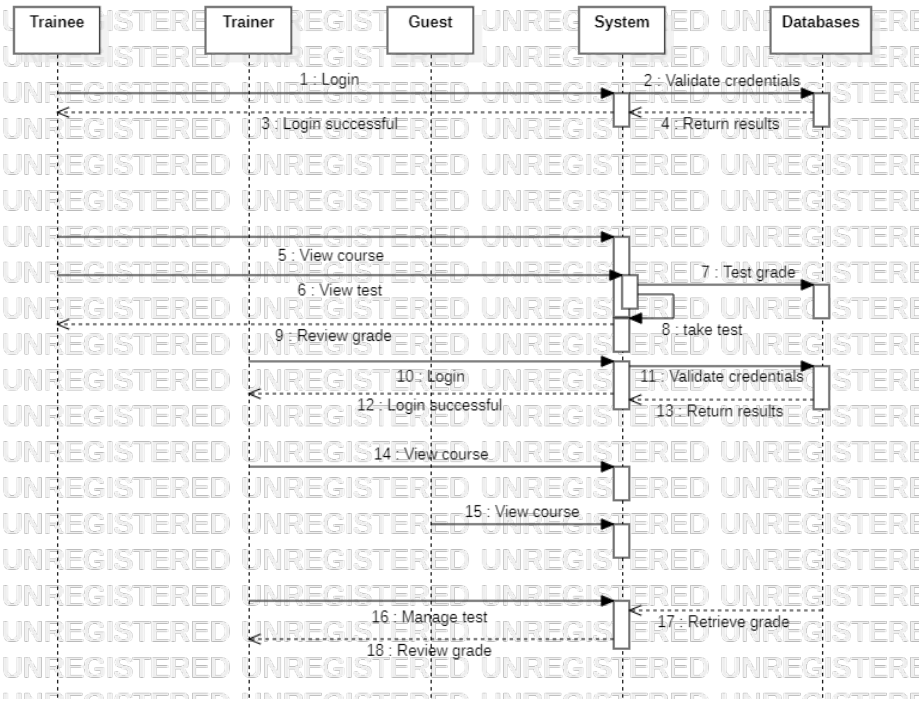

Figure 2. Sequence Diagram of the proposed system.

We then used an entity relationship diagram to graphically represent the relationship between all the entities and processes involved in our design. Figure 3 shows the overall entity relationship diagram of the proposed system.

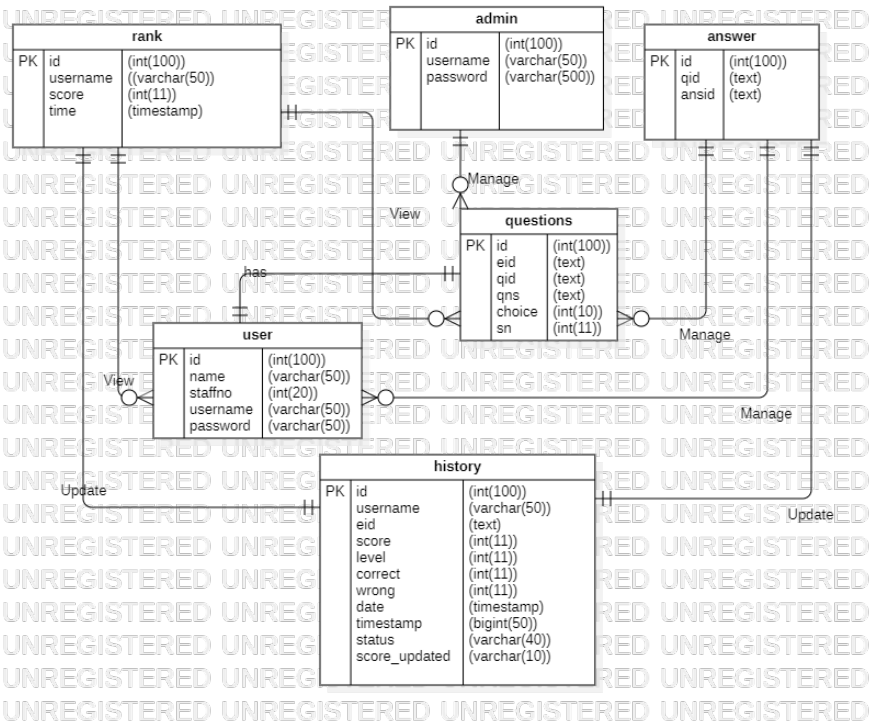

Figure 3. Entity Relationship Diagram of the proposed system.

C. Development

Next, we implemented the prototype which involves source code and user interface based on the hardware and software as mentioned. Due to the constraint of space, we provide here only few samples of system development screenshots. Figure 4a shows the prototype for the homepage of the proposed system during the initial design

development. Figure 4b shows the actual design for the homepage of the proposed system. Components such as training courses and assessment results are shown in Figure 4c and Figure 4d respectively.

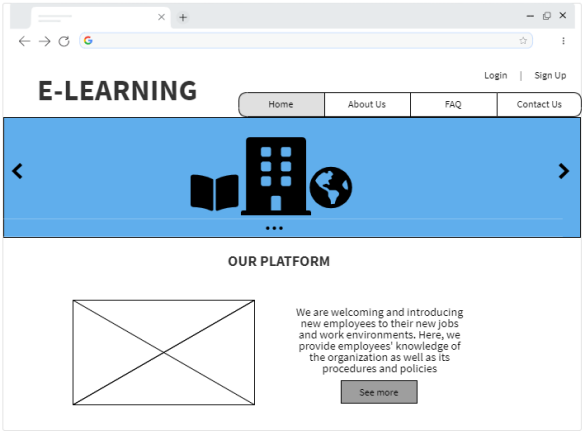

Figure 5a: Design homepage of e-learning

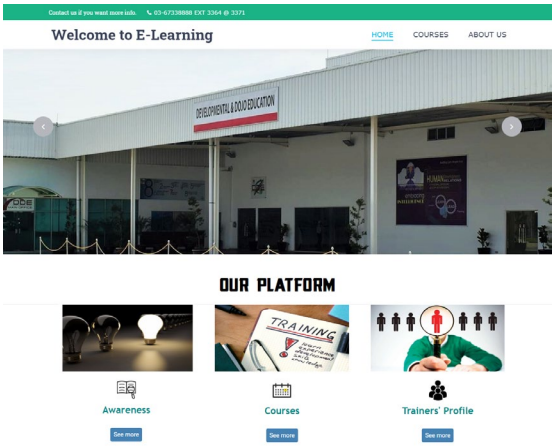

Figure 5b: Actual homepage of e-Learning

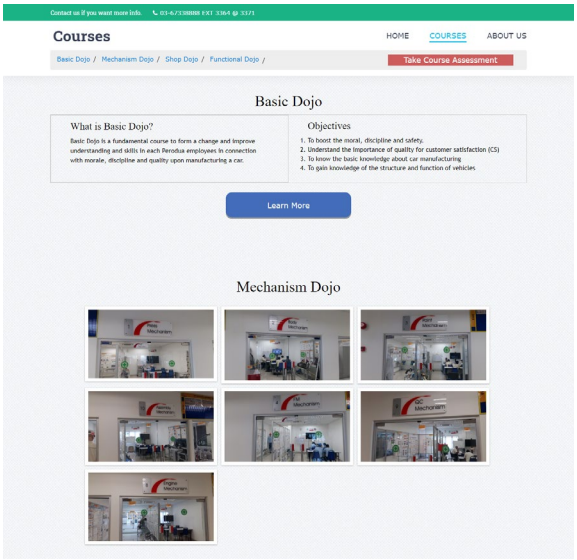

Figure 5c: Course page

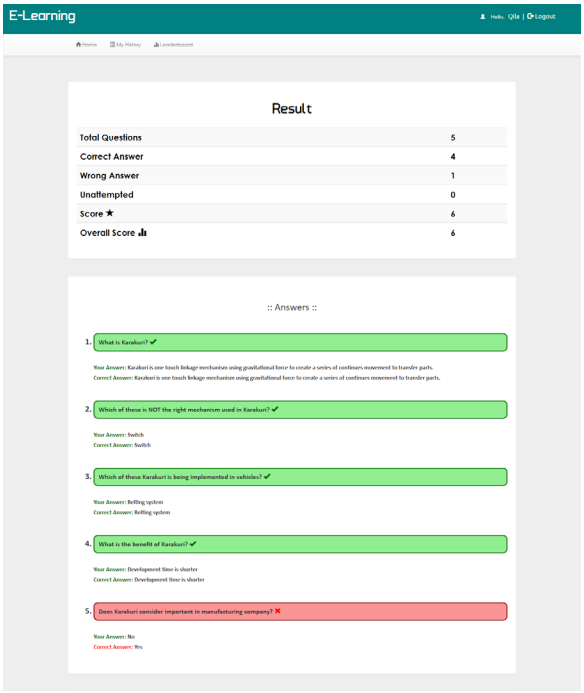

Figure 5d: Assessment result

D. Testing

The proposed prototype is tested and evaluated based on functionality and non-functionality. Two types of testing were conducted, functional and non-functional testing. The functional testing focuses on verifying each of the function in the prototype system operates according to the requirement specification. Meanwhile non-functional testing focuses on evaluating the usability of the prototype and ensure it achieves the user expectations and delivers smooth user experiences. These testing were done by the software developer and some random participants that we selected.

For functional testing, test cases were constructed based on the use case of the proposed project. Each test case will evaluate a specific function to verify whether the function works as intended. Some examples are shown in Tables 4.1-4.3.

Table 4.1: Test Case for Trainer Login Module

No	Test Case	Procedure	Expected Output	Pass/Fail
1	User can click on Login	1. Enter valid username and valid password 2. Click login button	1. User login successfully 2. Redirect to assessment page	Pass
		1. Enter valid username and invalid password 2. Click login button	1. Display error message to notify the invalid login	Pass
		1. Enter invalid username and valid password 2. Click login button	1. Display error message to notify the invalid login	Pass

Table 4.2: Test Case for Trainer Manage Assessment Module

No	Test Case	Procedure	Expected Output	Pass/Fail
1	User can add assessment	1. Click add quiz in Dashboard 2. Input quiz title, number of questions, marks and time limit for assessment 3. Click submit button	1. Display add quiz page 2. Display quiz form 3. Redirect to 'Home' menu dashboard	Pass
2	Remove Assessment	1. Click remove assessment in Dashboard 2. Click remove button	1. Display remove assessment page and list of assessment 2. The assessment is deleted	Pass

Table 4.3: Test Case for Trainee Take Assessment Module

No	Test Case	Procedure	Expected Output	Pass/Fail
1	Take assessment	1. Click take assessment button 2. Click answer option 3. Click lock option 4. Click finish option	1. Redirect to assessment page 2. The answer is chosen 3. The answer is locked 4. Redirect to result page	Pass

For non-functional testing, we conducted the usability testing with 10 respondents. These respondents consist of the staff of the automobile company. Their feedback are colour coded into five categories: purple means "strongly disagree", red means "disagree", light green means "neutral", yellow means "agree", and blue means "strongly agree". Figure 5a shows the feedback results on the user interface design and Figure 5b shows the user functionality. As can be observed, the majority of the participants strongly agreed to all of the relevant testing components. With the collected feedbacks, the weaknesses and errors of the system were identified. The feedback result were also used to improve the quality of the system for the future. Based on the results, we considered that our proposed prototype is able to satisfy the needs of a local company for its training purposes.

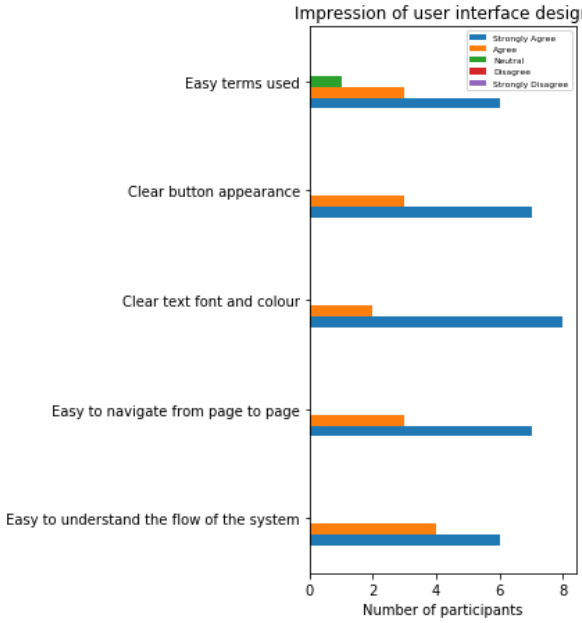

Figure 5a: Feedback on user interface design

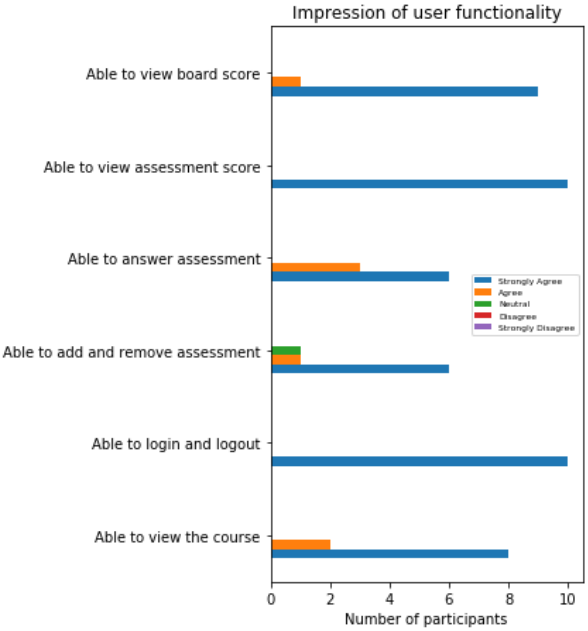

Figure 5b: Feedback user functionality

E. Deployment

At this stage, software deployment which includes all the steps, processes, and activities required to create a system or update was conducted. We released the proposed prototype system to be used by the company. Their feedbacks from the deployed system were collected, analyzed, and the prototype features were updated.

F. Review

Technical review of the current version of the system is made by the users and the developer itself. At this stage, we assessed which part of the objectives as per requirement have been achieved. Then, the status of the project was collectively analysed and re-design was considered for any incomplete features.

LIMITATION

This is a prototype of an E-learning system for a local automobile company. At the current stage of design, only the system administrator is able to manage all the course material. Meanwhile, trainers can only manage the Assessment and Evaluate trainee performance during the training session. Consequently, the system administrator needs to update the course material if there is any updated information. Besides, the system is incompatible with other devices such as mobile phones.

CONCLUSION

In conclusion, we proposed a web-based E-learning system that could improve the learning process in a local automobile company by achieving the outlined objectives. This paper presents the implementation of E-learning prototype with the Agile model. Moreover, the requirements and design discussed in previous section have been implemented. Thus, a user-friendly E-learning prototype system which provide an online platform for managing the education training was developed. This increases the possibilities for how, where and when employees can engage in lifelong learning.

REFERENCES

Ardent. (2019). *Ardent Knows Automotive*. Retrieved from https://ardentlearning.com/industries/automotive.aspx

Doug, B. (2020, Feb). *CLASSROOM.* Retrieved from How E-Learning Supports On-Demand Instruction for K–12 Schools: https://edtechmagazine.com/k12/article/2020/02/

Drawinbox. (2022). *Training And Development*. Retrieved from Meaning & Definition: https://explore.darwinbox.com/hr-glossary

eLeap. (2019). *e-learning system*. Retrieved from https://eleap.unimas.my/login/index.php

G-Cube. (2019). *Automobiles*. Retrieved from https://www.gc-solutions.net/solutions/automobiles/index.html

Maurer, H. &. (2001). E-Learning Has to be Seen as Part of General Knowledge Management. *Proceedings of ED-MEDIA 2001--World Conference on Educational Multimedia, Hypermedia & Telecommunications* (pp. 1249-1253). Norfolk, VA USA: Association for the Advancement of Computing in Education (AACE).

Nagra, G. (2020, Jan 27). *How E-learning Is Used in Various Industries – Some Examples*. Retrieved from CommLab India: https://blog.commlabindia.com/elearning-design/elearning-for-various-industries

Tay, L. (2008, December 10). *Agile Methodology: A Software Development Process Framework.* Retrieved from Yahoo! Voices: http://voices.yahoo.com/agile- methodology-software-development-process-framework-2263234.html